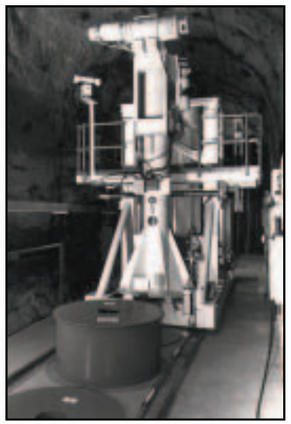
Each spent-fuel canister was moved over paved Nevada Test Site roads from the hot-cell facility to the mined test facility in a specially designed surface cask mounted on a low-boy trailer. The cask was upright for loading and almost horizontal for travel.



Canisters of spent nuclear fuel were entombed 1,400 feet below the Nevada Test Site as part of the DOE National Waste Terminal Storage Program. They were placed in holes drilled in the Climax granite formation and retrieved three years later.

Meeting Challenges of Nuclear Waste

In 1980, the Laboratory placed spent nuclear fuel 420 meters underground at the Nevada Test Site beneath the floor of a tunnel in Climax granite. In this experiment, Spent Fuel Test–Climax (SFT–C), researchers measured thermal loads from 11 canisters of spent fuel, 6 electrical heaters designed to mimic fuel canisters, and 20 electrical heaters in adjacent tunnels. The combined measurements of the three-year-long test simulated the thermal behavior of part of a large geologic repository for nuclear fuel.

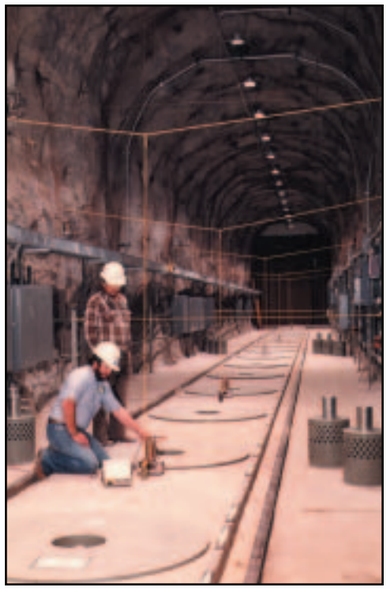
The Climax test was a significant large-scale field test for demonstrating essential technologies and revealing unexpected effects of high-level nuclear waste disposal in geologic repositories. Nuclear waste issues were looming on the horizon long before 1980, but Congress did not pass the Nuclear Waste Policy Act to deal with the problem until 1982.

Opportunities for testing at full scale were very limited this early in the U.S. nuclear waste management program. Livermore undertook SFT–C to demonstrate the feasibility of spent-fuel handling and retrieval from an underground repository and to address technical concerns about geologic repository operations and performance. The test was part of the Nevada Nuclear Waste Storage Investigations (NNWSI) project for the Department of Energy.

Operational objectives included packaging, transporting, storing, and retrieving highly radioactive fuel assemblies in a safe and reliable manner. In addition to emplacement and retrieval operations, three exchanges of spent-fuel assemblies between the SFT–C tunnel and a surface storage facility were part of this demonstration.

SFT–C technical objectives required a measurements program with nearly 1,000 field instruments and a computer-based data acquisition system. The system had to be robust enough to withstand the vagaries of the Nevada Test Site's power grid, shaking from nuclear weapons tests, and high temperatures caused by the thermal load. This was a major challenge for 1980s technology. When the Laboratory requested bids for a computer for logging the test data, only one company (Hewlett-Packard) answered the call. Undaunted, Livermore scientists and engineers designed most of the instruments, installed the system, and recorded geotechnical, seismological, and test status data on a continuing basis for the three-year storage phase and six months of monitored cool-down.

The SFT–C demonstrated the feasibility of deep geologic storage of spent nuclear fuel from commercial nuclear power reactors. The SFT–C showed the Laboratory's strong capabilities in materials science, nuclear science, earth sciences, advanced simulations, and engineered systems. The test's success provided a foundation for subsequent collaborations with nuclear waste disposal programs in other countries. More directly, as NNWSI evolved into the Yucca Mountain Project (YMP), the SFT–C helped prepare Livermore researchers for their role as experts in addressing YMP waste form, waste package, near-field environment, and repository performance issues.



Scientists perform an instrumentation checkout in the tunnel at the Nevada Test Site. The purpose of Spent Fuel Test–Climax was to determine the issues involved with storing and retrieving nuclear wastes underground.